IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	SHAMBLEN et al.	:	Confirmation No. 8707
Application No.:	10/814,965	:	Group Art Unit: 1742
Filed:	March 31, 2004	:	Examiner: Kathleen A. MCNELIS

For: PRODUCING NICKEL-BASE, COBALT-BASE, IRON-BASE, IRON-NICKEL-BASE, OR IRON-NICKEL-COBALT-BASE ALLOY ARTICLES BY REDUCTION OF NONMETALLIC PRECURSOR COMPOUNDS AND MELTING

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant files its Appeal Brief, together with a Fee Transmittal authorizing the charging of the required fee. A Notice of Appeal and fee were previously filed.

Real party in interest

The real party in interest is General Electric Co.

Related appeals and interferences

Applicant is not aware of any related appeals and/or interferences.

Status of claims

Claims 1-26 were filed. During prosecution, claims 1, 3, 17, 20, and 23 were amended, claims 2-3, 6, and 26 were cancelled, and new claims 27-29 were added.

Claims 1, 3-25, and 27-29 were rejected in the Final Office Action of February 28, 2007. Of these, claims 3 and 6 were subsequently canceled, leaving claims 1, 4-5, 7-25, and 27-29 finally rejected.

Applicant appeals the final rejection of claims 1, 4-5, 7-25, and 27-29. The appealed claims are reproduced in Appendix I.

Status of amendments

An Amendment After Final Rejection was filed in which claims 3 and 6 were cancelled. The Advisory Action indicates that the Amendment After Final Rejection was entered.

Summary of claimed subject matter

There are three independent method claims 1, 24, and 29. There are no means claims.

The steps of claim 1 are depicted in Figure 2. An article (20) is depicted in Figure 1, and particles (22) are depicted in Figures 3-4.

Claim 1 recites a method for producing a metallic article (20) comprising a metallic base, comprising the step of furnishing (step 30) a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article (20). p.8, lines 5-8, 13-14. The constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element. The method further includes chemically reducing (step 32) the mixture of nonmetallic precursor compounds to produce an initial metallic particle (22), without melting the initial metallic particle (22), (p.10, line 3-5) and melting and solidifying (step 34) (p.14, lines 3-8) the initial metallic particle (22) to produce a cast ingot of the metallic alloy (p.15, lines 5-6). The step of melting and solidifying (step 34) produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel. The cast ingot is processed (one or more of steps 36, 38, 40) to produce the metallic article (20). p.15, lines 5-14.

The steps of claim 24 are depicted in Figure 2. An article (20) is depicted in Figure 1, and particles (22) are depicted in Figures 3-4.

Claim 24 recites a method for producing a metallic article (20) comprising as constituents a metallic base selected from the group consisting of nickel, cobalt, iron, iron-

nickel, and iron-nickel-cobalt, and at least one alloying metal. The method comprises the step of furnishing (step 30) a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article (20). p.8, lines 13-21 The constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and at least one alloying metal. The method further includes chemically reducing (step 32) the mixture of nonmetallic precursor compounds to produce an initial metallic particle (22), without melting the initial metallic particle (22), (p.10, lines 3-5) melting and solidifying (step 34) the initial metallic particle (22) to produce a cast ingot (p.14, lines 3-8), and converting (step 36) the cast ingot into a billet. p.15, lines 5-9.

The steps of claim 29 are depicted in Figure 2. An article (20) is depicted in Figure 1, and particles (22) are depicted in Figures 3-4.

Claim 29 recites a method for producing a metallic article (20) comprising a metallic base, comprising the step of furnishing (step 30) a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article (20). p.8, lines 13-21. The constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element, chemically reducing (step 32) the mixture of nonmetallic precursor compounds to produce an initial metallic particle (22), without melting the initial metallic particle (22) (p.10, lines 3-5), and melting and solidifying (step 34) (p.14, lines 3-8) the initial metallic particle (22) to produce a cast ingot. p.15, lines 5-9. The step of melting and solidifying (step 34) produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel. The method includes converting (step 36) the cast ingot into a billet, fabricating (step 38) the billet into the metallic article (20), wherein the metallic article (20) is a component of a gas turbine engine, and heating treating (step 40) the metallic article (20) prepared in the step of fabricating (step 38). p.15, lines 5-14.

Grounds of rejection to be reviewed on appeal

Ground 1. Claims 1, 3, 5-7, 11, 13, 14, 15, 17-19, 20, 21, 24, and 27-29 are rejected under 35 USC 103 over Grant U.S. Patent 3,000,734 in view of "applicant's admitted prior art (paragraphs 0002-0004 of the instant specification)."

Ground 2. Claims 1, 3-6, 9, 11-15, 20, 21, 22, and 23 are rejected under 35 USC 103 over Kuehmann U.S. Patent 6,695,930 in view of Talmage U.S. Patent 3,495,958.

Ground 3. Claims 10, 16, 24, and 27 are rejected under 35 USC 103 over Kuehmann '930 in view of Talmage '958, and further in view of Peras '608.

Ground 4. Claims 1, 3-6, 8, 10, 11, 13-15, 22, and 23 are rejected under 35 USC 103 over Kuehmann '930 in view of Bienvenu U.S. Patents 4,820,339.

Ground 5. Claims 10, 16, 24, and 27 are rejected under 35 USC 103 over Kuehmann '930 in view of Bienvenu '339 and further in view of Peras '608.

Ground 6. Claims 24-25 are rejected under 35 USC 103 over Nagata U.S. Pub. 2002/0005089 or Kundrat U.S. Pat. 5,567,224 and further in view of Peras U.S. Pat. 3,234,608.

Argument

The Present Inventions

The present inventions as recited in the claims are to a method in which a mixture of nonmetallic precursor compounds are first chemically reduced without melting, and subsequently are melted and solidified. They are then processed to a final product.

The advantages of this approach are discussed at para. [0013]-[0014] of the Specification:

> **[0013]** The present approach is a hybrid process in which the initial metallic particles are produced without melting, and then the initial metallic particles are melted and solidified. This approach provides significant advantages over alternative approaches for producing metallic articles, which typically melt the starting materials at an early stage of the processing. The present approach achieves a reduced cost because fewer melting steps are used to produce high-quality alloys. The present approach also avoids the use of costly master alloys. Master alloys, which are premelted compositions incorporating elements that are difficult to melt to form homogeneous alloys using conventional melting practices, are widely used in conventional melting practice. The master alloys are usually costly to obtain, increasing the costs of the final product. Further, the master alloying manufacturing process may introduce defects that may be carried into the final product. In the present

approach, nonmetallic precursor compounds of most alloying elements are relatively inexpensive, and the required compositions are prepared by simply mixing the nonmetallic precursor compounds. Immiscibility and other problems that necessitate the use of master alloys in conventional melting practice are not present. Master alloys may be used in the subsequent melting, but that use is greatly reduced as compared with conventional practice.

[0014] The present approach also avoids many of the mechanical and chemical defects found in conventionally prepared metallic articles. Mechanical defects associated with ceramic-containing melts may be avoided or greatly reduced in most instances. Master alloys are used little if at all, largely avoiding chemical defects that find their origin in the master alloys and the blended materials, and in the chemical inhomogeneities that result from the initial melting. The metallic article is produced with only a single melting, typically without the use of a ceramic crucible. The result is a greatly reduced incidence of ceramic inclusions, which are one of the major concerns for conventionally produced alloys. The improved results are achieved with significantly reduced cost, due to the reduced number of melting steps and the reduced use of master alloys.

The prior art references that are combined in the various grounds of rejection typically include one reference that produces its product without melting, and one reference that produces its product with melting. The theory of the rejections is that these unrelated references, which on their faces teach in opposite and incompatible directions, can be combined sequentially in the order recited in the present claims to simulate the present invention. The only basis set forth for making this combination is to form a hindsight reconstruction of the present invention, based solely upon the Examiner's knowledge of the present invention. Certainly the references themselves do not suggest these combinations.

Significantly, none of the art has suggested that there is any advantage to be gained by first mixing nonmetallic precursor compounds and chemically reducing them to metallic particles without melting, and then melting and casting the resulting metallic alloys. As a result, the art has not suggested the ordering of steps recited in the present claims, and has not suggested the combining of the references that on their faces teach in opposite directions.

Ground 1. Claims 1, 3, 5-7, 11, 13, 14, 15, 17-19, 20, 21, 24, and 27-29 are rejected under 35 USC 103 over Grant U.S. Patent 3,000,734 in view of "applicant's admitted prior art (paragraphs 0002-0004 of the instant specification)."

Claims 3 and 6 have now been cancelled.

Grant teaches processing where most of the constituents of a metallic alloy are supplied as metals. One constituent is supplied as a nonmetal. In the particular circumstances of Grant, there is a chemical exchange reaction, with the result of the reaction being that one of the supplied metals is converted into a nonmetal, and the cation of the nonmetal is converted to its metallic form.

"Admitted prior art"

The "applicant's admitted prior art (paragraphs 0002-0004 of the instant specification)" does not qualify as prior art under §103, and may not be used to form the present rejection.

MPEP 2129 II provides what may be used as prior art from the Specification:

> "Where the specification identifies work done by another as 'prior art,' the subject matter so identified is treated as admitted prior art."

This position is supported in the MPEP by a reference to In re Nomiya, "holding applicant's labeling of two figures in the application drawings as 'prior art' to be an admission that what was pictured was prior art relative to applicant's improvement."

The present Specification does not label or otherwise identify anything as "prior art," and specifically does not identify the material at para. [0002]-[0004] as "prior art." "applicant's admitted prior art (paragraphs 0002-0004 of the instant specification)" must be withdrawn to conform to MPEP practice.

Even if the material were properly considered, the "admitted prior art" must be considered in its entirety; it describes what does not work.

Merits of the rejection

In the following discussion and for the sake of argument, Applicant will address the "admitted prior art" as though it is properly applied. As demonstrated above, it is not properly applied.

MPEP 2142, under ESTABLISHING A PRIMA FACIE CASE OF OBVIOUSNESS, provides: "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]. *See* MPEP para 2143-2143.03 for decisions pertinent to each of these criteria."

First requirement--there must be an objective
basis for combining the teachings of the references

The first of the requirements of MPEP 2142 is that "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings." The present rejection is a §103 combination rejection. To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2142, 2143 and 2143.01. *See also*, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

> "The PTO has the burden under §103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

> "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."
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> "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."
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> * * * * *
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> "A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure.

"[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational

underpinning to support the legal conclusion of obviousness." In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006)

In this case, Grant is applied for a teaching that the material is to be produced without melting the constituents. The "admitted prior art" is applied for an express teaching to the contrary (para. [0004]): "These components and other articles are typically manufactured by furnishing the metallic constituents of the selected alloy, melting the constituents, and casting the molten mixture into a crucible to form a cast ingot." There is no basis stated for attempting to combine two references that teach directly against each other.

Second requirement--there must be
an expectation of success

The second of the requirements of MPEP 2142 is an expectation of success. This requirement has not been addressed in the explanation of the rejection, and in any event more than Examiner's argument is required here.

As stated in MPEP 2142, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]."

Third requirement--the prior art
must teach the claim limitations

The third of the requirements of MPEP 2142 is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." In this regard, the following principle of law applies to all §103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Claims 1, 7

Claim 1 recites in part:

> "furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article..."

Neither reference has such a teaching. Grant teaches that metallic powders (not nonmetallic precursor compounds, as recited) are mixed together for all but one constituent of the metallic article (Final Office Action, page 4, lines 17-19). At no point does Grant suggest that there is furnished "a mixture of at least two nonmetallic precursor compounds," those nonmetallic precursor compounds "together comprising the constituents of the metallic article..." In Grant, nearly all of the constituents of the metallic article are furnished as metals, not nonmetallic precursor compounds.

"Admitted prior art" teaches away from this limitation, by teaching that the constituents are furnished as metals: "These components and other articles are typically manufactured by furnishing the metallic constituents of the selected alloy..." (para. [0004])

It is a well-established principle of law that a prima facie case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a prima facie case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)."

In the case of Grant, a person of ordinary skill is taught to use metallic starting materials, not "nonmetallic precursor compounds." In the case of the "admitted prior art," a person of ordinary skill is taught to make the metallic article by melting the metallic constituents together.

Claim 1 also recites in part:

"chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle"

Neither reference teaches this limitation, because neither reference teaches a "mixture of nonmetallic precursor compounds."

Claim 1 further recites in part:

"melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel;"

Neither reference teaches producing "an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel."

These terms have a specifically defined meaning in the present application, as defined in para. [0021]-[0022] of the present specification:

[0021] The present approach is most preferably applied to the production of nickel-base, cobalt-base, iron-base, iron-nickel-base, or iron-nickel-cobalt-base superalloys. As used herein, a "superalloy" is a nickel-base, cobalt-base, iron-base, iron-nickel-base, or iron-nickel-cobalt-base alloy having at least two phases, including a continuous matrix phase with a face-centered-cubic crystal structure that is strengthened by both solid solution strengthening and the presence of one or more additional discrete phases that are distributed throughout the matrix phase, where the discrete phases have a different composition than the matrix phase. The strengthening discrete phase or phases present in the superalloy in its fully heat treated, service condition-form, is at least about 5 percent by volume in the case of iron-base superalloys, at least about 10 percent by volume in the case of nickel-base, iron-nickel-base, and iron-nickel-cobalt-base superalloys, and at least about 1 percent by volume in the case of cobalt-base superalloys.

[0022] The present approach may be applied to the production of martensitic steels. "Martensitic steel" as used herein is defined as having a composition

of an iron-base alloy, wherein iron is present in an amount of at least about 50 percent by weight, which possesses a continuous body-centered cubic (BCC) or body-centered tetragonal (BCT) crystal structure matrix phase. At least about 75 percent by volume of the BCC or BCT matrix phase is present in an acicular phase morphology in the service condition, which develops as a result of a diffusionless phase transformation from the austenitic (face centered cubic, FCC) phase through non-equilibrium accelerated cooling (i.e., quenching)…

At no location does either reference teach materials having these limitations.

Claim 1 further recites in part:

"melting and solidifying the initial metallic particle to produce a cast ingot"

Grant teaches that the initial metallic material is not melted, and accordingly teaches away from the claimed approach. Grant may not be used as a basis for a prima facie ground of rejection.

The explanation of the rejection admits that Grant has no such teaching (Final Office Action, page 5, lines 8-13). It then seeks to find this teaching in the "admitted prior art." The "admitted prior art" is not properly applied for the reasons discussed above. But if it were properly applied, it teaches directly contrary to the presently claimed invention. The "admitted prior art" teaches that melting and casting is the primary fabrication technology, not applied after a step of chemical reduction without melting.

Claim 5

Claim 5 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 5 is therefore allowable over this ground of rejection.

Claim 5 further recites in part:

"an additional step, performed prior to the completion of the step of melting and solidifying, of

producing a mixture of a metallic material and an other additive constituent."

This step must occur prior to the completion of the step of melting and solidifying.

An "other additive constituent as used herein is defined in para. [0034] of the present application:

> **[0034]** Some constituents, termed "other additive constituents", may be difficult to introduce. For example, suitable nonmetallic precursor compounds of the constituents may not be available, or the available nonmetallic precursor compounds of the other additive constituents may not be readily chemically reducible in a manner or at a temperature consistent with the chemical reduction of other nonmetallic precursor compounds, or the other additive constituents may be too costly to add in the usual form. It may be necessary that such other additive constituents ultimately be present as elements in solid solution in the article, as compounds formed by reaction with other constituents of the article, or as already-reacted, substantially inert compounds dispersed through the article. These other additive constituents or precursors thereof may be introduced from the gas, liquid, or solid phase, as may be appropriate, using one of the four approaches subsequently described or other operable approaches.

Specific techniques relating to "other additive constituents" are described at para. [0035]-[0038]. Neither reference has any such teaching, and the explanation of the rejection does not identify any location where this limitation is taught. At page 5, lines 14-17 of the Final Office Action, it is admitted that "the sequence is not specified in Grant..." There is no basis for this rejection.

Claim 11

Claim 11 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 11 is therefore allowable over this ground of rejection.

Claim 11 further recites in part:

> "mixing a nonmetallic modifying element into the nonmetallic precursor compound, wherein the nonmetallic modifying element is selected from the group consisting of nitrogen and carbon."

The explanation of the rejection asserts (Final Office Action, page 5, lines 14-17) that this limitation is met by mixing carbon with titanium. That does not teach this claim limitation, which requires that nitrogen or carbon be mixed with a "nonmetallic precursor compound." Titanium is certainly not a "nonmetallic precursor compound."

Claim 13

Claim 13 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 13 is therefore allowable over this ground of rejection.

Claim 13 further recites in part:

> "melting and solidifying the initial metallic particle to produce the metallic article, without any addition of a metallic alloying element to the initial metallic particle."

As noted earlier, neither reference teaches the basic melting and solidifying step of claim 1, and cannot teach this dependent limitation. The explanation of the rejection does not point to any location in either reference where this limitation is arguably taught.

Claim 14

Claim 14 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 14 is therefore allowable over this ground of rejection.

Claim 14 further recites in part:

> "the step of melting and solidifying includes the step of
> adding a metallic alloying element to the initial metallic particle while the initial metallic particle is melted."

The explanation of the rejection asserts that this limitation is met by adding carbon to titanium to form TiC (Final Office Action, page 5, lines 14-17). That step of Grant does not arguably amount to adding "a metallic alloying element" (carbon is not a metal). This same section of the Final Office Action further admits that the "sequence is not specified," and therefore it cannot teach the portion of the limitation "while the initial metallic particle is melted."

Claim 15

Claim 15 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 15 is therefore allowable over this ground of rejection.

Claim 15 further recites in part:

> "melting and solidifying the initial metallic particle without contacting a ceramic material."

The explanation of the rejection does not mention this negative limitation, which is certainly not taught by either reference.

Claim 17

Claim 17 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 17 is therefore allowable over this ground of rejection.

Claim 17 further recites in part:

"the step of melting and solidifying includes the step of
adding an alloying element."

The explanation of the rejection admits that this limitation is not found in Grant, and then argues that this limitation is found in the "admitted prior art" (Final Office Action, page 5, lines 8-13. The step of "melting and casting" following a step of chemically reducing is not taught in the "admitted prior art" for the reasons stated earlier. And there is certainly no teaching of adding an alloying element during a subsequent melting and casting step in either reference. The explanation of the rejection does not point to any location where this limitation is said to be taught in the prior art.

Claim 18

Claim 18 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 18 is therefore allowable over this ground of rejection.

Claim 18 further recites in part:

"the cast article is a cast ingot, and wherein the method includes an additional step, after the step of melting and solidifying, of
converting the cast ingot into a billet."

Neither reference has this teaching, and the explanation of the rejection does not identify to any location in either reference where it is said to be taught. The "admitted prior art," if improperly applied, teaches that its processing is entirely by melting and casting, not melting and casting following chemical reduction.

Claim 19

Claim 19 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 19 is therefore allowable over this ground of rejection.

Claim 19 further recites in part:

"after the step of melting and solidifying, of
mechanically working the metallic article."

Neither reference teaches a step of melting and solidifying that follows a step of chemical reduction. There can be no teaching of mechanically working the metallic article produced by such a step following melting and solidifying.

Claim 24

Claim 24 recites in part:

"furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article."

Neither reference has such a teaching. Grant teaches that metallic powders (not nonmetallic precursor compounds) are mixed together for all but one constituent of the metallic article (Final Office Action, page 4, lines 17-19). At no point does Grant suggest that there is furnished "a mixture of at least two nonmetallic precursor compounds," those nonmetallic precursor compounds "together comprising the constituents of the metallic article..." In Grant, nearly all of the constituents of the metallic article are furnished as metals, not nonmetallic precursor compounds.

"Admitted prior art" teaches away from this limitation, by teaching that the constituents are furnished as metals: "These components and other articles are typically manufactured by furnishing the metallic constituents of the selected alloy..." (para. [0004])

Claim 24 also recites in part:

"chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle"

Neither reference teaches this limitation, because neither reference teaches a "mixture of nonmetallic precursor compounds."

Claim 24 further recites in part:

> "melting and solidifying the initial metallic particle to produce a cast ingot"

Grant teaches that the initial metallic material is not melted, and accordingly teaches away from the claimed approach. Grant may not be used as a basis for a prima facie ground of rejection.

Claim 27

Claim 27 depends from claim 24 and incorporates its limitations. Claim 24 is not taught for the reasons stated above, which are incorporated here. Claim 27 is therefore allowable over this ground of rejection.

Claim 27 further recites in part:

> "melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel;"

Neither reference teaches producing "an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel."

These terms have a specifically defined meaning in the present application, as defined in para. [0021]-[0022] of the present specification, which were quoted in the response to the rejection of claim 1 above. Neither reference has such a teaching.

Claim 28

Claim 28 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 28 is therefore allowable over this ground of rejection.

Claim 28 further recites in part:

"an additional step, after the step of melting and solidifying of producing a component of a gas turbine engine."

The melting and solidifying step follows the step of chemical reduction. Neither reference teaches processing wherein there is a melting and solidifying step following chemical reduction, and then a production of a component of a gas turbine engine.

Claim 29

Claim 29 recites in part:

"furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article"

Neither reference has such a teaching. Grant teaches that metallic powders (not nonmetallic precursor compounds) are mixed together for all but one constituent of the metallic article (Final Office Action, page 4, lines 17-19). At no point does Grant suggest that there is furnished "a mixture of at least two nonmetallic precursor compounds," those nonmetallic precursor compounds "together comprising the constituents of the metallic article..." In Grant, nearly all of the constituents of the metallic article are furnished as metals, not nonmetallic precursor compounds.

"Admitted prior art" teaches away from this limitation, by teaching that the constituents are furnished as metals: "These components and other articles are typically manufactured by furnishing the metallic constituents of the selected alloy..." (para. [0004]).

Claim 29 also recites in part:

"chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle."

Neither reference teaches this limitation, because neither reference teaches a "mixture of nonmetallic precursor compounds."

Claim 29 further recites in part:

> "melting and solidifying the initial metallic particle to produce a cast ingot"

Grant teaches that the initial metallic material is not melted, and accordingly teaches away from the claimed approach. Grant may not be used as a basis for a prima facie ground of rejection.

The dependent claims include additional limitations that additionally render them patentable, but these additional limitations need not be addressed at this time.

Ground 2. Claims 1, 3-6, 9, 11-15, 20, 21, 22, and 23 are rejected under 35 USC 103 over Kuehmann U.S. Patent 6,695,930 in view of Talmage U.S. Patent 3,495,958.

Claims 3 and 6 have now been cancelled.

Kuehmann teaches producing a steel by conventional melting and casting. Kuehmann teaches away from the present approach by using conventional metals as the starting materials, and therefore may not be used as the basis for the rejection.

Talmage teaches producing a steel using metallic powders as the starting materials. Some alloying elements may be supplied as reducible compounds. The powders are compacted. Talmage teaches that there is no melting of the compacted mass of powders. Talmage thus teaches away from the present claim recitations and cannot be used as a reference.

First requirement--there must be an objective
basis for combining the teachings of the references

The explanation of the rejection gives no objective basis for combining the teachings of the references. Moreover, it is difficult to see how the teachings could be reconciled and combined. Kuehmann teaches that the steel is prepared by melting the starting materials. Talmage teaches that the steel is prepared by not melting the starting materials. So, in the combination of teachings, which is it to be--melting or not melting?

Second requirement--there must be

an expectation of success

This requirement is not addressed in the explanation of the rejection. Certainly there can be no expectation of success when the two references teach directly opposite to each other.

Third requirement--the prior art
must teach the claim limitations

Claims 1, 15

Claim 1 recites in part:

> "furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article..."

Neither reference has such a teaching. Kuehmann admittedly does not teach this limitation (Final Office Action, page 6, lines 5-7) because it uses all-metallic starting materials, and uses no nonmetallic precursor compounds. Talmage teaches starting with metallic powders, not nonmetallic precursor compounds, for the major part of the constituents of the metallic article (col. 3, lines 39-42; col. 5, lines 14-18; Example 1 at col. 8, lines 20-27). Talmage may use reducible metal oxide powders for minor portions of the constituents of the metallic article (col. 5, line 38-col. 6, line 4; Example 1 at col. 8, lines 20-27).

The explanation of the rejection admits that Kuehmann has no such teaching (Final Office Action, page 5, lines 5-7), but goes on to argue (Final Office Action, page 5, lines 8-17) that Talmage has such a teaching. But here is how Talmage himself describes his processing: "...I can start with relatively high purity metals..." (col. 3 lines 42-44). Talmage does not suggest that he can start with "nonmetallic precursor compounds"--he starts with "high purity metals."

The quoted language of claim 1 means that the nonmetallic precursor compounds must furnish the constituents of the metallic article. Neither reference has such a teaching.

Claim 1 also recites in part:

"chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle"

Neither reference teaches this limitation, because neither reference teaches a "mixture of nonmetallic precursor compounds" as previously quoted.

Claim 1 further recites in part:

"chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

"melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel;"

Neither reference teaches first chemically reducing without melting to get initial metallic particles, and then melting the initial metallic particles.

Claim 1 further recites in part:

"melting and solidifying the initial metallic particle to produce a cast ingot"

Talmage teaches that the initial metallic material is not melted, and accordingly teaches away from the claimed approach. Talmage may not be used as a basis for a prima facie ground of rejection.

Claim 4

Claim 4 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 4 is therefore allowable over this ground of rejection.

Claim 4 further recites in part:

"the step of melting and solidifying produces an alloy having a martensitic steel composition."

A "martensitic steel composition" as recited in claim 4 is defined in [0022] of the present specification as quoted above.

Neither reference has such a teaching, nor has the explanation of the rejection pointed to any such teaching in either reference.

Claim 5

Claim 5 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 5 is therefore allowable over this ground of rejection.

Claim 5 further recites in part:

"an additional step, performed prior to the completion of the step of melting and solidifying, of

producing a mixture of a metallic material and an other additive constituent."

This step must occur prior to the completion of the step of melting and solidifying.

An "other additive constituent as used herein is defined in [0034] of the present specification as quoted above.

Specific techniques relating to "other additive constituents" are described at para. [0035]-[0038]. Neither reference has any such teaching, and the explanation of the rejection does not identify any location where this limitation is taught. There is no basis for this rejection.

Claim 9

Claim 9 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 9 is therefore allowable over this ground of rejection.

Claim 9 further recites in part:

"the step of chemically reducing includes the step of

chemically reducing the compound mixture by vapor-phase reduction."

The meaning of "vapor-phase reduction" is defined para. [0028] of the Specification:

"**[0028]** In a preferred reduction approach, termed vapor-phase reduction because the nonmetallic precursor compounds are furnished as vapors or gaseous phase..."

The explanation of the rejection (Final Office Action, page 6, 2-3 lines from bottom of page) argues that because the reducing agent hydrogen is a gas, the prior art teaches the present process. In "vapor phase-reduction" as used herein, it is the nonmetallic precursor compounds that must be in the vapor or gaseous phase, not the reducing agent.

The references do not teach the invention of claim 9.

Claim 11

Claim 11 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 11 is therefore allowable over this ground of rejection.

Claim 11 further recites in part:

"the step of chemically reducing includes the step of

mixing a nonmetallic modifying element into the nonmetallic precursor compound, wherein the nonmetallic modifying element is selected from the group consisting of nitrogen and carbon."

The references have no such teaching.

The explanation of the rejection (Final Office Action, page 6, last line on page) relies upon a teaching of carbon in Kuehmann. But the Final Office Action (page 6, lines 5-7) also admits that Kuehmann does not teach the use of nonmetallic precursor compounds. Kuehmann does not stand for the proposition that nitrogen and/or carbon can be mixed into a nonmetallic precursor compound.

Claim 12

Claim 12 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 12 is therefore allowable over this ground of rejection.

Claim 12 further recites in part:

> "the step of chemically reducing includes the step of
> chemically reducing the nonmetallic precursor compound in a time of less than about 10 seconds."

The art has no such teaching.

The explanation of the rejection (Final Office Action, page 7, lines 1-4) relies on disclosure at col. 1, lines 20-30 of Talmage as suggesting that "time is a result effective variable." This portion of Talmage deals with "time sufficient to obtain a desired degree of weight loss," not a time for chemical reduction. Talmage plainly states that he starts "with relatively high purity metals" (col. 3, lines 40-43), and does not use precursor compounds that together comprise the constituents of the metallic article, as recited in claim 12. There is no chemical reduction in this portion of Talmage.

Claim 13

Claim 13 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 13 is therefore allowable over this ground of rejection.

Claim 13 further recites in part:

> "melting and solidifying the initial metallic particle to produce the metallic article, without any addition of a metallic alloying element to the initial metallic particle." [emphasis added]

Claim 13 includes a negative limitation. The explanation of the rejection does not address this negative limitation, and does not identify a location in the references where the negative limitation is said to be taught.

The explanation of the rejection (Final Office Action, page 7, lines 5-8) references MPEP 2144.04 IV.C. This portion of the MPEP has no conceivable relevance to the

limitations of claim 13, which have nothing to do with the order or sequence of adding elements.

Claim 14

Claim 14 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 14 is therefore allowable over this ground of rejection.

Claim 14 further recites in part:

> "the step of melting and solidifying includes the step of
>
> adding a metallic alloying element to the initial metallic particle while the initial metallic particle is melted."

The "initial metallic particle" is a particle that resulted in the step of chemically reducing nonmetallic precursor compounds, see parent claim 1. Prior to that point, the initial metallic particle does not exist. As discussed at length in Kuehmann, the Co, Cr, and V are introduced in an initial melting operation, not to "initial metallic particles" that are produced in the step of chemically reducing nonmetallic precursor compounds.

The explanation of the rejection (Final Office Action, page 7, lines 5-8) references MPEP 2144.04 IV.C. This portion of the MPEP has no conceivable relevance to the limitations of claim 14, which have nothing to do with the order or sequence of adding elements.

Claim 22

Claim 22 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 22 is therefore allowable over this ground of rejection.

Claim 22 further recites in part:

> "the metallic article is a superalloy composition, and wherein the method includes an additional step, after the step of melting and solidifying, of
>
> solution heat treating and ageing the metallic article." [emphasis added]

The references do not teach this limitation.

The explanation of the rejection (Final Office Action, page 7, lines 11-13) references col. 2, lines 23-37 and col. 9, lines 40-55 of Kuehmann. Neither of these locations teaches aging of a metallic article. There is a discussion of tempering, but that is not ageing.

Claim 23

Claim 23 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 23 is therefore allowable over this ground of rejection.

Claim 23 further recites in part:

"the metallic article is a martensitic steel composition"

As used herein, a "martensitic steel composition" is defined in [0022] of the present specification as quoted above.

Neither reference has such a teaching, and the explanation of the rejection does not suggest that they do.

Ground 3. Claims 10, 16, 24, and 27 are rejected under 35 USC 103 over Kuehmann '930 in view of Talmage '958, and further in view of Peras '608.

Claim 10

Claim 10 depends from claim 1 and incorporate its limitations. The combination of Kuehmann and Talmage does not teach the limitations of claim 1 for the reasons discussed earlier, which are incorporated here. Peras adds nothing helpful in regard to claim 1. Accordingly, dependent claim 10 is patentable over this ground of rejection.

Applicant incorporates the discussion of the First Requirement and the Second Requirement from the Ground 2 rejection. Peras adds yet another variation, and does not provide a basis for reconciling the contradictory teachings of Kuehmann and Talmage.

Claim 10 recites in part:

"furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle, wherein the step of chemically reducing includes the step of chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal;" [the underlined portion is from claim 10, and the remaining portion is from parent claim 1]

There is no teaching of "forming a mixture of at least two nonmetallic precursor compounds" and then "chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal." The relied-upon teaching in Peras is conventional reduction of iron oxide in a slag floating on a liquid metal pool that was formed by conventional techniques.

Claim 16

Claim 16 depends from claim 1 and incorporate its limitations. The combination of Kuehmann and Talmage does not teach the limitations of claim 1 for the reasons discussed earlier, which are incorporated here. Peras adds nothing helpful in regard to claim 1. Accordingly, dependent claim 16 is patentable over this ground of rejection.

Applicant incorporates the discussion of the First Requirement and the Second Requirement from the Ground 2 rejection. Peras adds yet another variation, and does not provide a basis for reconciling the contradictory teachings of Kuehmann and Talmage.

Claim 16 recites in part:

"furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel, wherein the step of melting and solidifying includes the step of melting and solidifying the initial metallic particle without contacting a ceramic material;" [the underlined portion is from claim 10, and the remaining portion is from parent claim 1]"

There is no teaching of "forming a mixture of at least two nonmetallic precursor compounds" and then "chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal" and then melting and solidifying "without contacting a ceramic material."

The recited step "melting and solidifying the initial metallic particle without contacting a ceramic material" is a negative limitation. To establish a basis for the rejection, the prior art must teach this negative limitation. The discussion at col. 8, lines 6-14 of Peras does not mention ceramics at all, much less a teaching that there is no contact with a ceramic material. There is no suggestion that the device discussed at col. 8, lines 6-14 has no ceramic contacting the melt. All of that is just supposition by the Examiner.

Claim 24

Claim 24 recites in part:

"furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article"

None of the references has such a teaching. Kuehmann admittedly does not teach this limitation (Final Office Action, page 6, lines 5-7) because it uses all-metallic starting materials. Talmage teaches starting with metallic powders, not nonmetallic precursor compounds, for the major part of the constituents of the metallic article. (col. 3, lines 39-42; col. 5, lines 14-18; Example 1 at col. 8, lines 20-27). Talmage may use reducible metal

oxide powders for minor portions of the constituents of the metallic article (col. 5, line 38-col. 6, line 4; Example 1 at col. 8, lines 20-27). Peras has no pertinent teaching.

The quoted language of claim 24 means that the nonmetallic precursor compounds must furnish and constitute the constituents of the metallic article. None of the references have such a teaching.

Claim 24 also recites in part:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle"

The references do not teach this limitation, because they do not teach a "mixture of nonmetallic precursor compounds."

Claim 24 further recites in part:

> "melting and solidifying the initial metallic particle [which was produced without melting in the step of chemically reducing] to produce a cast ingot; and
>
> converting the cast ingot into a billet." [explanatory material added]

None of the three references teaches melting and solidifying previously unmelted metallic particles to make cast ingot, and then converting the cast ingot into a billet. Kuehmann teaches that its metallic particles are produced by melting, and Talmage teaches against melting at any stage. This limitation means that a cast ingot must first be produced, and then the cast ingot is "converted" into a billet, *see* para. [0043]. Peras teaches to the contrary, as its molten material is cast directly into billet form, according to Peras (col. 2, lines 18-35).

Claim 27

Claim 27 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 27 is therefore allowable over this ground of rejection.

Claim 27 further recites in part:

> "the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel."

The explanation of the rejection (Final Office Action, page 10, last two lines on page) relies on Kuehmann as teaching a martensitic steel.

As used herein, a "martensitic steel composition" is defined in [0022] of the present specification as quoted above.

None of the references has such a teaching, and the explanation of the rejection does not suggest that they do.

Ground 4. Claims 1, 3-6, 8, 10, 11, 13-15, 22, and 23 are rejected under 35 USC 103 over Kuehmann '930 in view of Bienvenu U.S. Patents 4,820,339.

Claims 3 and 6 have been canceled.

Kuehmann teaches producing a steel by conventional melting and casting. Kuehmann teaches away from the present approach by using conventional metals as the starting materials, and therefore may not be used as the basis for the rejection.

Bienvenu teaches a process which "makes it possible to obtain reduced metals in either the liquid or solid state..." (col. 1, lines 11-13). The "solid state" that Bienvenu teaches has the metals in the form of powders (col. 4, lines 28-32). The reduced metal may be an alloy produced from a mixture of several halides. However, "the direct production of alloys in powdered form does not appear to be feasible." (col. 3, lines 44-46). That is, Bienvenu teaches that it is not possible to form metallic particles, without melting the metallic particles. Bienvenu therefore may not be used as a basis for rejecting the claims.

Applicant emphasizes this point. The present claims are rejected as "obvious" over Kuehmann, that teaches conventional melting and casting, and Bienvenu. All claims rejected under Ground 4 recite: "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle," while Bienvenu teaches "the direct production of alloys in powdered form does not appear to be feasible."

First requirement--there must be an objective
basis for combining the teachings of the references

The explanation of the rejection gives no objective basis for combining the teachings of the references. Moreover, it is difficult to see how the teachings could be reconciled and

combined to teach anything other than an approach by which alloy particles are produced by melting. Kuehmann teaches that the steel is prepared by melting the starting materials, which are metals, not nonmetallic precursor compounds. Bienvenu teaches a direct reduction process, but one in which it is not possible to make unmelted metallic particles of alloys. So, there seems to be no alternative to the conclusion that the combination of teachings must teach melting to produce alloys.

MPEP 2143.01 provides that, in constructing a §103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2142 and 2143.02 require that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed approach of combining the teachings of Kuehmann and Bienvenu, except if the point of the combination is to teach a process that requires melting of the initial metallic particles.

Second requirement--there must be
an expectation of success

This requirement is not addressed in the explanation of the rejection.

Third requirement--the prior art
must teach the claim limitations

Claims 1, 15

Claim 1 recites in part:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;"

Neither reference teaches this limitation, because both references teach melting in order to produce alloyed initial metallic particles.

Claim 1 further recites in part:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

> "melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel;"

Neither reference teaches first chemically reducing without melting to get initial metallic particles, and then melting the initial metallic particles. Both references require melting to produce alloys. As discussed earlier, Kuehmann teaches a conventional melting approach. Bienvenu teaches that melting is required to produce alloys, although pure metals may be produced without melting.

Claim 4

Claim 4 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 4 is therefore allowable over this ground of rejection.

Claim 4 further recites in part:

> "the step of melting and solidifying produces an alloy having a martensitic steel composition."

A "martensitic steel composition" as recited in claim 4 is defined in [0022] of the present specification as quoted above.

Neither reference has such a teaching, nor has the explanation of the rejection pointed to any such teaching in either reference.

Claim 5

Claim 5 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 5 is therefore allowable over this ground of rejection.

Claim 5 further recites in part:

"an additional step, performed prior to the completion of the step of melting and solidifying, of

producing a mixture of a metallic material and an other additive constituent."

This step must occur prior to the completion of the step of melting and solidifying.

An "other additive constituent as used herein is defined in [0034] of the present specification as quoted above.

Specific techniques relating to "other additive constituents" are described at para. [0035]-[0038]. Neither reference has any such teaching, and the explanation of the rejection does not identify any location where this limitation is taught. There is no basis for this rejection.

Claim 8

Claim 8 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 8 is therefore allowable over this ground of rejection.

Claim 8 further recites in part:

"chemically reducing the compound mixture by fused salt electrolysis."

The explanation of the rejection discusses (Final Office Action, page 6, lines 2-3) Bienvenu's technique described at col. 2 lines 6-21, which is not an electrolysis process. It then goes on to refer to "fused salt hydrolysis [sic, not "electrolysis" as claimed] as taught by Bienvenu" (Final Office Action, page 9 line 5). Bienvenu's process is not fused salt electrolysis, as claimed, and the explanation of the rejection does not assert that is.

Claim 10

Claim 10 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 10 is therefore allowable over this ground of rejection.

Claim 10 further recites in part:

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle, wherein the step of chemically reducing includes the step of chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal" [the underlined portion is from claim 10, and the remaining portion is from parent claim 1]

Bienvenu expressly teaches that "the direct production of alloys in powdered form does not appear to be feasible" (col. 3, lines 44-47). Bienvenu teaches that its process does not work to achieve the "initial metallic particle" of claim 10.

Claim 11

Claim 11 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 11 is therefore allowable over this ground of rejection.

Claim 11 further recites in part:

"the step of chemically reducing includes the step of

mixing a nonmetallic modifying element into the nonmetallic precursor compound, wherein the nonmetallic modifying element is selected from the group consisting of nitrogen and carbon."

The references have no such teaching.

The explanation of the rejection (Final Office Action, page 9, line 12) relies upon a teaching of carbon in Kuehmann. But the Final Office Action (page 6, lines 5-7) also admits that Kuehmann does not teach the use of nonmetallic precursor compounds. Kuehmann does not stand for the proposition that nitrogen and/or carbon can be mixed into a nonmetallic precursor compound.

Claim 13

Claim 13 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 13 is therefore allowable over this ground of rejection.

Claim 13 further recites in part:

> "melting and solidifying the initial metallic particle to produce the metallic article, without any addition of a metallic alloying element to the initial metallic particle." [emphasis added]

Claim 13 includes a negative limitation. The explanation of the rejection does not address this negative limitation, and does not identify a location in the references where the negative limitation is said to be taught.

The explanation of the rejection (Final Office Action, page 9, lines 13-16) references MPEP 2144.04 IV.C. This portion of the MPEP has no conceivable relevance to the limitations of claim 13, which have nothing to do with the order or sequence of adding elements.

Claim 14

Claim 14 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 14 is therefore allowable over this ground of rejection.

Claim 14 further recites in part:

> "the step of melting and solidifying includes the step of
> adding a metallic alloying element to the initial metallic particle while the initial metallic particle is melted."

The "initial metallic particle" is a particle that resulted in the step of chemically reducing nonmetallic precursor compounds, see parent claim 1. Prior to that point, the initial metallic particle does not exist. As discussed at length in Kuehmann, the Co, Cr, and V are introduced in an initial melting operation, not to "initial metallic particles" that are produced in the step of chemically reducing nonmetallic precursor compounds.

The explanation of the rejection (Final Office Action, page 9, lines 13-16) references MPEP 2144.04 IV.C. This portion of the MPEP has no conceivable relevance to the limitations of claim 14, which have nothing to do with the order or sequence of adding elements.

Claim 22

Claim 22 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 22 is therefore allowable over this ground of rejection.

Claim 22 further recites in part:

> "the metallic article is a superalloy composition, and wherein the method includes an additional step, after the step of melting and solidifying, of
>
> solution heat treating and ageing the metallic article." [emphasis added]

The references do not teach this limitation.

The explanation of the rejection (Final Office Action, page 7, lines 11-13) references col. 2, lines 23-37 and col. 9, lines 40-55 of Kuehmann. Neither of these locations teaches aging of a metallic article. There is a discussion of tempering, but that is not aging.

Claim 23

Claim 23 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 23 is therefore allowable over this ground of rejection.

Claim 23 further recites in part:

> "the metallic article is a martensitic steel composition"

As used herein, a "martensitic steel composition" is defined in [0022] of the present specification as quoted above. Neither reference has such a teaching, and the explanation of the rejection does not suggest that they do.

Ground 5. Claims 10, 16, 24, and 27 are rejected under 35 USC 103 over Kuehmann '930 in view of Bienvenu '339 and further in view of Peras '608.

Claim 10

Claim 10 depends from claim 1 and incorporate its limitations. The combination of Kuehmann and Bienvenu does not teach the limitations of claim 1 for the reasons discussed earlier, which are incorporated here. Peras adds nothing helpful in regard to claim 1. Accordingly, dependent claim 10 is patentable over this ground of rejection.

Applicant incorporates the discussion of the First Requirement and the Second Requirement from the Ground 3 rejection. Peras adds yet another variation, and does not provide a basis for reconciling the contradictory teachings of Kuehmann and Bienvenu.

Claim 10 recites in part:

> "furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;
>
> chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle, wherein the step of chemically reducing includes the step of chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal;" [the underlined portion is from claim 10, and the remaining portion is from parent claim 1]

There is no teaching of "forming a mixture of at least two nonmetallic precursor compounds" and then "chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal." The relied-upon teaching in Peras is conventional reduction of iron oxide in a slag floating on a liquid metal pool that was formed by conventional techniques.

Claim 16

Claim 16 depends from claim 1 and incorporate its limitations. The combination of Kuehmann and Bienvenu does not teach the limitations of claim 1 for the reasons discussed

earlier, which are incorporated here. Peras adds nothing helpful in regard to claim 1. Accordingly, dependent claim 16 is patentable over this ground of rejection.

Applicant incorporates the discussion of the First Requirement and the Second Requirement from the Ground 3 rejection. Peras adds yet another variation, and does not provide a basis for reconciling the contradictory teachings of Kuehmann and Bienvenu.

Claim 16 recites in part:

> "furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;
>
> chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;
>
> melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel, wherein the step of melting and solidifying includes the step of melting and solidifying the initial metallic particle without contacting a ceramic material;" [the underlined portion is from claim 10, and the remaining portion is from parent claim 1]"

There is no teaching of "forming a mixture of at least two nonmetallic precursor compounds" and then "chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal" and then melting and solidifying "without contacting a ceramic material."

The recited step "melting and solidifying the initial metallic particle without contacting a ceramic material" is a negative limitation. To establish a basis for the rejection, the prior art must teach this negative limitation. The discussion at col. 8, lines 6-14 of Peras does not mention ceramics at all, much less a teaching that there is no contact with a ceramic material. There is no suggestion that the device discussed at col. 8, lines 6-14 has no ceramic contacting the melt. All of that is just supposition by the Examiner.

Claim 24

Claim 24 recites in part:

> "furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article."

None of the references has such a teaching. Kuehmann admittedly does not teach this limitation (Final Office Action, page 6, lines 5-7) because it uses all-metallic starting materials. Bienvenu teaches starting with metallic powders, not nonmetallic precursor compounds, for the major part of the constituents of the metallic article (col. 3, lines 39-42; col. 5, lines 14-18; Example 1 at col. 8, lines 20-27). Bienvenu may use reducible metal oxide powders for minor portions of the constituents of the metallic article (col. 5, line 38-col. 6, line 4; Example 1 at col. 8, lines 20-27). Peras has no pertinent teaching.

The quoted language of claim 1 means that the nonmetallic precursor compounds must furnish and constitute the constituents of the metallic article. None of the references have such a teaching.

Claim 24 additionally recites in part:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle."

The references do not teach this limitation. Kuehmann does not perform a chemical reduction because it starts with metals, not precursor compounds. Bienvenu expressly teaches away from this limitation by teaching "the direct production of alloys in powdered form does not appear to be feasible" (col. 3, lines 44-47).

Claim 24 further recites in part:

> "melting and solidifying the initial metallic particle [which was produced without melting in the step of chemically reducing] to produce a cast ingot; and
>
> converting the cast ingot into a billet." [explanatory material added]

None of the three references teaches melting and solidifying previously unmelted metallic particles to make cast ingot, and then converting the cast ingot into a billet. Kuehmann teaches that its metallic particles are produced by melting, and Bienvenu

teaches against melting at any stage. This limitation means that a cast ingot must first be produced, and then the cast ingot is "converted" into a billet, *see* para. [0043]. Peras teaches to the contrary, as its molten material is cast directly into billet form, according to Peras (col. 2, lines 18-35).

Claim 27

Claim 27 depends from claim 1 and incorporates its limitations. Claim 1 is not taught for the reasons stated above, which are incorporated here. Claim 27 is therefore allowable over this ground of rejection.

Claim 27 further recites in part:

> "the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel."

The explanation of the rejection (Final Office Action, page 10, last two lines on page) relies on Kuehmann as teaching a martensitic steel.

As used herein, a "martensitic steel composition" is defined in [0022] of the present specification as quoted above. None of the references has such a teaching, and the explanation of the rejection does not suggest that they do.

Ground 6. Claims 24-25 are rejected under 35 USC 103 over Nagata U.S. Pub. 2002/0005089 or Kundrat U.S. Pat. 5,567,224 and further in view of Peras U.S. Pat. 3,234,608.

The Final Office Action does not present the explanation of the rejection, and instead references the discussion from the Non-Final Office Action of November 15, 2006, found at page 6, line 18-page 8, line 3. The following discussion will also refer to that Non-Final Office Action.

First requirement--there must be an objective
basis for combining the teachings of the references

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each

reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure.

In this case, there is no objective basis for combining the teachings of the different references. The explanation of the rejection argues that the basis is to remove contaminates and producing marketable billets (Non-Final Office Action, page 7, lines 8-14). Nagata has no teaching of contaminates that must be removed, and therefore a person of ordinary skill would have no reason to look to a secondary process that removes contaminates. Nor does Nagata teach that its process cannot produce marketable billets, and therefore there is no reason for a person of ordinary skill to look to a secondary process that is argued to produce marketable billets. Similarly, Kundrat has no teaching of contaminates that must be removed, and therefore a person of ordinary skill would have no reason to look to a secondary process that removes contaminates. Nor does Kundrat teach that its process cannot produce marketable billets, and therefore there is no reason for a person of ordinary skill to look to a secondary process that is argued to produce marketable billets.

Second requirement--there must be
an expectation of success

The second of the requirements of MPEP 2142 is an expectation of success. There is no expectation of success.

As stated in MPEP 2142, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]."

Third requirement--the prior art
must teach the claim limitations

The third of the requirements of MPEP 2142 is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." In this regard, the following principle of law applies to all §103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)."

[emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Claim 24

Claim 24 recites in part:

> "melting and solidifying the initial metallic particle to produce a cast ingot; and
>
> converting the cast ingot into a billet."

None of the three references teaches melting and solidifying metallic particles to make cast ingot, and then converting the cast ingot into a billet. This limitation means that a cast ingot must first be produced, and then the cast ingot is "converted" into a billet, *see* para. [0043]. Peras teaches to the contrary, as its molten material is cast directly into billet form, according to Peras (col. 2, lines 18-35).

Claim 25

Claim 25 depends from claim 24 and incorporates its limitations. Claim 24 is not taught for the reasons stated above, which are incorporated here. Claim 25 is therefore allowable over this ground of rejection.

Claim 25 recites in part:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle, wherein the step of chemically reducing includes the step of chemically reducing the mixture by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal" [the underlined portion is from claim 25, and the remaining portion is from parent claim 24]

The explanation of the rejection (Non-Final Office Action, page 7, lines 15-19) relies on col. 5, lines 1-5 of Peras. But just look at what Peras says there: “The iron is dissolved in the metallic bath.”

The claim limitation recites “produce an initial metallic particle, without melting the initial metallic particle,” and Peras teaches that the “iron is dissolved in the metallic bath.” Peras does not teach a particle, and teaches directly away from the recited limitation “without melting the initial metallic particle” by requiring that the iron is molten.

SUMMARY AND CONCLUSION

The present claims recite a multistep operation, wherein two key steps are:

> "chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;
>
> melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel..." [quoted from claim 1].

The closest of the art rejections are formed by taking one reference that produces its final product by chemical reduction, and a second inconsistent reference that produces its final product by melting and solidifying, and asserting without any basis that the two incompatible teachings are to be combined in a sequential fashion. And even then, they do not teach the claim limitations.

Applicant asks that the Board reverse the rejections.

For all of the foregoing reasons, Applicant asks that the Board reverse the rejections. The Commissioner is authorized to charge any fees that may be due or credit any overpayments to the undersigned's Account Number 50-1059.

Respectfully submitted,

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Dated: July 18, 2007

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APPENDIX I

Copy of Claims Involved in the Appeal

1. A method for producing a metallic article comprising a metallic base, comprising the steps of

furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

melting and solidifying the initial metallic particle to produce a cast ingot of the metallic alloy, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel; and

processing the cast ingot to produce the metallic article.

4. The method of claim 1, wherein the step of melting and solidifying produces an alloy having a martensitic steel composition.

5. The method of claim 1, including an additional step, performed prior to the completion of the step of melting and solidifying, of

producing a mixture of a metallic material and an other additive constituent.

7. The method of claim 1, wherein the step of chemically reducing includes the step of

chemically reducing the compound mixture by solid-phase reduction.

8. The method of claim 1, wherein the step of chemically reducing includes the step of

chemically reducing the compound mixture by fused salt electrolysis.

9. The method of claim 1, wherein the step of chemically reducing includes the step of

chemically reducing the compound mixture by vapor-phase reduction.

10. The method of claim 1, wherein the step of chemically reducing includes the step of

chemically reducing the nonmetallic precursor compound by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal.

11. The method of claim 1, wherein the step of chemically reducing includes the step of

mixing a nonmetallic modifying element into the nonmetallic precursor compound, wherein the nonmetallic modifying element is selected from the group consisting of nitrogen and carbon.

12. The method of claim 1, wherein the step of chemically reducing includes the step of

chemically reducing the nonmetallic precursor compound in a time of less than about 10 seconds.

13. The method of claim 1, wherein the step of melting and solidifying includes the step of

melting and solidifying the initial metallic particle to produce the metallic article, without any addition of a metallic alloying element to the initial metallic particle.

14. The method of claim 1, wherein the step of melting and solidifying includes the step of

adding a metallic alloying element to the initial metallic particle while the initial metallic particle is melted.

15. The method of claim 1, wherein the step of melting and solidifying includes the step of

solidifying the metallic article as a cast article.

16. The method of claim 1, wherein the step of melting and solidifying includes the step of

melting and solidifying the initial metallic particle without contacting a ceramic material.

17. The method of claim 1, wherein the step of melting and solidifying includes the step of

adding an alloying element.

18. The method of claim 15, wherein the cast article is a cast ingot, and wherein the method includes an additional step, after the step of melting and solidifying, of

converting the cast ingot into a billet.

19. The method of claim 1, including an additional step, after the step of melting and solidifying, of

mechanically working the metallic article.

20. The method of claim 1, wherein the step of processing includes the step of

post processing the metallic article.

21. The method of claim 1, including an additional step, after the step of melting and solidifying, of

heat treating the metallic article.

22. The method of claim 1, wherein the metallic article is a superalloy composition, and wherein the method includes an additional step, after the step of melting and solidifying, of

solution heat treating and ageing the metallic article.

23. The method of claim 1, wherein the metallic article is a martensitic steel composition, and wherein the method includes an additional step, after the step of melting and solidifying, of

heat treating the metallic article to form a martensitic microstructure, wherein the step of heating treating includes the steps of

heating the metallic article above a required temperature, and

cooling the metallic article.

24. A method for producing a metallic article comprising as constituents a metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and at least one alloying metal, comprising the steps of

furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and at least one alloying metal;

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

melting and solidifying the initial metallic particle to produce a cast ingot; and

converting the cast ingot into a billet.

25. The method of claim 24, wherein the step of chemically reducing includes the step of

chemically reducing the mixture by contact with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal.

27. The method of claim 24, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel.

28. The method of claim 1, including an additional step, after the step of melting and solidifying of

producing a component of a gas turbine engine.

29. A method for producing a metallic article comprising a metallic base, comprising the steps of

furnishing a mixture of at least two nonmetallic precursor compounds together comprising the constituents of the metallic article, wherein the constituents comprise the metallic base selected from the group consisting of nickel, cobalt, iron, iron-nickel, and iron-nickel-cobalt, and mixtures thereof, and at least one alloying element;

chemically reducing the mixture of nonmetallic precursor compounds to produce an initial metallic particle, without melting the initial metallic particle;

melting and solidifying the initial metallic particle to produce a cast ingot, wherein the step of melting and solidifying produces an alloy that is a nickel-base superalloy, a cobalt-base superalloy, an iron-base superalloy, an iron-nickel-base superalloy, an iron-nickel-cobalt-base superalloy, or a martensitic steel;

converting the cast ingot into a billet;

fabricating the billet into the metallic article, wherein the metallic article is a component of a gas turbine engine; and

heating treating the metallic article prepared in the step of fabricating.

APPENDIX II

Evidence Entered and Relied Upon in the Appeal

None.

APPENDIX III

Related Proceedings

None.